

**THE FOLLOWING ARE THE ENGLISH TRANSLATION  
OF ANNEXES TO THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT (ARTICLE 34):**

**Amended Sheets (Pages 5, 20 and 140)**

insufficient properties of being bistable material.

The present invention has been accomplished in view of the above problems of the conventional techniques, and it is an object of the present invention to provide a switching element suitable for mass production, where the compositional deviation of materials can be suppressed, uniform properties in the characteristic of bistability can be attained, and an organic bistable material by itself can exhibit sufficient bistability.

#### DISCLOSURE OF THE INVENTION

Namely, the present invention provides a switching element which comprises: an organic bistable material, the organic bistable material having two stable states in resistance under applied voltage; at least two electrodes, the electrodes being placed such that the organic bistable material is arranged between two of the electrodes, the switching element being characterized in that the organic bistable material comprises at least a compound having an electron-donating functional group and an electron-accepting functional group in a molecule of said compound.

In the switching element of the present invention, since the organic bistable material is of a one-component system having an electron donating functional group and an electron-accepting functional group in one molecule, fluctuation of the compositional ratio at the time of production hardly occurs unlike the conventional two-component system

RECEIVED BY  
AIR MAIL

preferably used.

As the electrode layers 21a and 21b, metal materials such as aluminum, gold, silver, nickel and iron, inorganic materials such as ITO and carbon, conjugate organic materials, organic materials such as liquid crystals, semiconductor materials such as silicon, etc. may appropriately be selected, and the electrode layers are not limited thereto.

Next, the present invention is characterized in that the organic bistable material to be used for the bistable material layer 30 comprises at least a compound having an electron-donating functional group and an electron-accepting functional group in each molecule of the compound.

As the electron-donating functional group,  $-\text{SCH}_3$ ,  $-\text{OCH}_3$ ,  $-\text{NH}_2$ ,  $-\text{NHCH}_3$ ,  $-\text{N}(\text{CH}_3)_2$ , etc. may be mentioned. As the electron-accepting functional group,  $-\text{CN}$ ,  $-\text{NO}_2$ ,  $-\text{CHO}$ ,  $-\text{COCH}_3$ ,  $-\text{COOC}_2\text{H}_5$ ,  $-\text{COOH}$ ,  $-\text{Br}$ ,  $-\text{Cl}$ ,  $-\text{I}$ ,  $-\text{OH}$ ,  $-\text{F}$ ,  $=\text{O}$ , etc. may be mentioned.

Further, as the compound having an electron-donating functional group and an electron-accepting functional group in each molecule of the compound, an aminoimidazole type compound, a pyridone type compound, a styryl type compound, a stilbene type compound, a butadiene type compound, etc. may be mentioned.

Among the above compounds, in the present invention, it is preferred to use an aminoimidazole type compound of the following formula (A):

RECEIVED  
APR 10 1988

## CLAIMS

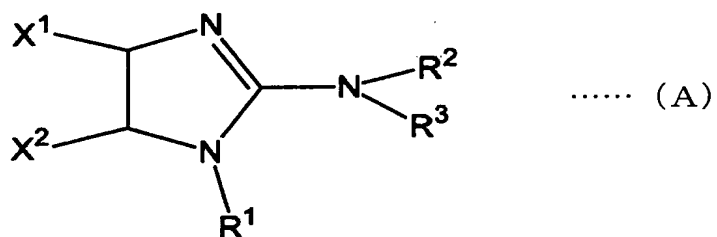
1. A switching element which comprises:

an organic bistable material, the organic bistable material having two stable states in resistance under applied voltage;

at least two electrodes, the electrodes being placed such that the organic bistable material is arranged between two of the electrodes,

the switching element being characterized in that the organic bistable material comprises at least a compound having an electron-donating functional group and an electron-accepting functional group in a molecule of said compound.

2. The switching element according to Claim 1, wherein the compound is an aminoimidazole type compound of the following formula (A):



wherein each of  $X^1$  and  $X^2$  is CN or  $\text{NO}_2$ , and each of  $R^1$ ,  $R^2$  and  $R^3$  is a hydrogen atom or a  $\text{C}_{1-6}$  alkyl group which may have a

RELEASED BY  
AUG 1980

## PATENT COOPERATION TREATY

PCT

NOTIFICATION CONCERNING  
SUBMISSION OR TRANSMITTAL  
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

MATSUI, Shigeru  
2nd Floor, Ginza Todoroki Bldg.  
16-5, Ginza 8-chome  
Chuo-ku, Tokyo 104-0061  
Japan

Date of mailing (day/month/year) 09 October 2003 (09.10.03)	
Applicant's or agent's file reference 02P00951 PC	<b>IMPORTANT NOTIFICATION</b>
International application No. PCT/JP03/08599	International filing date (day/month/year) 07 July 2003 (07.07.03)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 05 July 2002 (05.07.02)
Applicant FUJI ELECTRIC CO., LTD. et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(\*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, **the attention of the applicant is directed to Rule 17.1(c)** which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, **the attention of the applicant is directed to Rule 17.1(c)** which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
05 July 2002 (05.07.02)	2002-196734	JP	22 Augu 2003 (22.08.03)
05 July 2002 (05.07.02)	2002-196728	JP	22 Augu 2003 (22.08.03)
13 Sept 2002 (13.09.02)	2002-267689	JP	03 Octo 2003 (03.10.03)
13 Sept 2002 (13.09.02)	2002-267688	JP	03 Octo 2003 (03.10.03)
18 Sept 2002 (18.09.02)	2002-271911	JP	03 Octo 2003 (03.10.03)
18 Sept 2002 (18.09.02)	2002-271912	JP	03 Octo 2003 (03.10.03)
18 Sept 2002 (18.09.02)	2002-271910	JP	03 Octo 2003 (03.10.03)
18 Sept 2002 (18.09.02)	2002-271909	JP	03 Octo 2003 (03.10.03)
06 Nove 2002 (06.11.02)	2002-322055	JP	03 Octo 2003 (03.10.03)
14 Febr 2003 (14.02.03)	2003-36684	JP	03 Octo 2003 (03.10.03)

<b>The International Bureau of WIPO</b> 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No. (41-22) 338.70.10	Authorized officer  <b>Farid ABBOU</b>  Telephone No. (41-22) 338 8169
---	--

## Continuation of Form PCT/IB/304

## NOTIFICATION CONCERNING SUBMISSION OR TRANSMITTAL OF PRIORITY DOCUMENT

Date of mailing (day/month/year)

09 October 2003 (09.10.03)

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
14 Febr 2003 (14.02.03)	2003-36683	JP	03 Octo 2003 (03.10.03)

# PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

## PCT

### NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:

MATSUI, Shigeru  
2nd Floor, Ginza Todoroki Bldg.  
16-5, Ginza 8-chome  
Chuo-ku, Tokyo 104-0061  
JAPON

Date of mailing (day/month/year) 15 January 2004 (15.01.2004)		IMPORTANT NOTICE	
Applicant's or agent's file reference 02P00951 PC			
International application No. PCT/JP2003/008599	International filing date (day/month/year) 07 July 2003 (07.07.2003)	Priority date (day/month/year) 05 July 2002 (05.07.2002)	
Applicant FUJI ELECTRIC CO., LTD. et al			

1. Notice is hereby given that the International Bureau has **communicated**, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this notice:

AU, AZ, BY, CH, CN, CO, DE, DZ, EP, HU, JP, KG, KP, KR, MD, MK, MZ, RU, TM, US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE, AG, AL, AM, AP, AT, BA, BB, BG, BR, BZ, CA, CR, CU, CZ, DK, DM, EA, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, ID, IL, IN, IS, KE, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MG, MN, MW, MX, NO, NZ, OA, OM, PH, PL, PT, RO, SD, SE, SG, SK, SL, TJ, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this notice is a copy of the international application as published by the International Bureau on 15 January 2004 (15.01.2004) under No. WO 2004/006351

4. **TIME LIMITS** for filing a demand for international preliminary examination and for entry into the national phase

The applicable time limit for entering the national phase will, **subject to what is said in the following paragraph**, be **30 MONTHS** from the priority date, not only in respect of any elected Office if a demand for international preliminary examination is filed before the expiration of **19 months** from the priority date, but also in respect of any designated Office, in the absence of filing of such demand, where Article 22(1) as modified with effect from 1 April 2002 applies in respect of that designated Office. For further details, see *PCT Gazette* No. 44/2001 of 1 November 2001, pages 19926, 19932 and 19934, as well as the *PCT Newsletter*, October and November 2001 and February 2002 issues.

In practice, **time limits other than the 30-month time limit** will continue to apply, for various periods of time, in respect of certain designated or elected Offices. For **regular updates on the applicable time limits** (20, 21, 30 or 31 months, or other time limit), Office by Office, refer to the *PCT Gazette*, the *PCT Newsletter* and the *PCT Applicant's Guide*, Volume II, National Chapters, all available from WIPO's Internet site, at <http://www.wipo.int/pct/en/index.html>.

For filing a **demand for international preliminary examination**, see the *PCT Applicant's Guide*, Volume I/A, Chapter IX. Only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination (at present, all PCT Contracting States are bound by Chapter II).

It is the applicant's **sole responsibility** to monitor all these time limits.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  Gijsbertus Beijer - Carlos Roy
Facsimile No.(41-22) 740.14.35	Telephone No.(41-22) 338.91.11

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP03/08599

## A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl<sup>7</sup> H01L51/00, H01L29/786, H01L45/00, H01L27/10

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl<sup>7</sup> H01L51/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2003
Kokai Jitsuyo Shinan Koho	1971-2003	Toroku Jitsuyo Shinan Koho	1994-2003

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

JOIS

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	Haruo KAWAKAMI et al. "Aminoimidazoledicarbonitrile no Denkiteki Soantei Tokusei", 2003 Nen Shunki Dai 50 Kai Oyo Butsurigaku Kankei Rengo Koenkai Koen Yokoshu, 27 March, 2003 (27.03.03), separate Vol.3, page 1340	1-19
X	WO 02/37500 A1 (THE REGENTS OF THE UNIVERSITY OF CALIFORNIA), 10 May, 2002 (10.05.02), Full text; Figs. 1 to 17 & AU 6506801 A	1-19
X	MA, L.P. et al., 'Organic electrical bistable devices and rewritable memory cells', APPLIED PHYSICS LETTERS, Vol.80, No.16, 22 April, 2002 (22.04.02), pages 2997 to 2999	1-19

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 07 October, 2003 (07.10.03)	Date of mailing of the international search report 21 October, 2003 (21.10.03)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP03/08599

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MA, L.P. et al., 'Data storage with 0.7nm recording marks on a crystalline organic thin film by a scanning tunneling microscope', APPLIED PHYSICS LETTERS, Vol.73, No.6, 10 August, 1998 (10.08.98), pages 850 to 852	1-19